

Bidirectional Dual Active Bridge Power Converter for Spacecraft Power Systems, Phase I

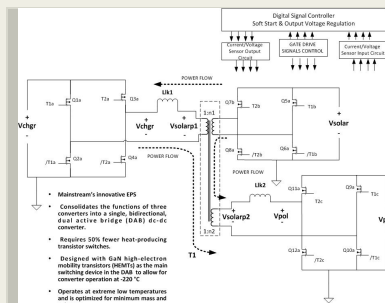
Completed Technology Project (2016 - 2016)



Project Introduction

A bidirectional dual active bridge (DAB) dc-dc converter for electrical power systems (EPS) is proposed. The converter operates as a charger, upconverter, and downconverter using a single transformer. The converter uses smart technology to interleave DAB converter stages for ripple current reduction and optimized load sharing of stages to extend the high efficiency load range of the converter to 6.25% of full load. By using smart technology, the load condition of each DAB converter stage is monitored and its load sharing controlled depending on the converters total load condition. In this way, each converter stage is kept at or above 25% load. Therefore the minimum load of the new DAB converter with four interleaved stages is one fourth of 25% or 6.25%. The design employs radiation-resistant and cryogenic-temperature-capable GaN HEMT devices to process 2 kW of power per stage. Mainstream has tested GaN HEMT devices to -225 °C. GS66508T GaN HEMT devices are rated for 650 VDC maximum drain-to-source maximum voltage stress allowing for a maximum steady-operating voltage of 400 VDC at 60% derating.

Primary U.S. Work Locations and Key Partners



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Table of Contents

Project Introduction	1
Primary U.S. Work Locations and Key Partners	1
Project Transitions	2
Images	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	2
Technology Areas	3
Target Destinations	3

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Organizations Performing Work	Role	Type	Location
Mainstream Engineering Corporation	Lead Organization	Industry	Rockledge, Florida
● Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations

California	Florida
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Project Transitions

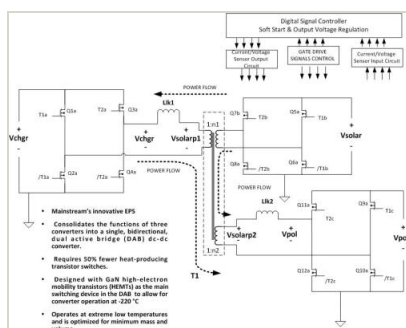
▶ **June 2016:** Project Start

✓ **December 2016:** Closed out

Closeout Documentation:

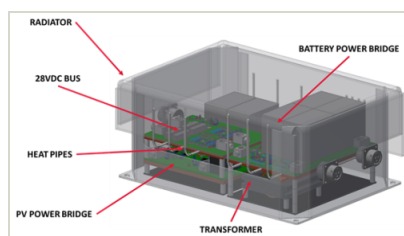
- Final Summary Chart(<https://techport.nasa.gov/file/139601>)

Images



Briefing Chart Image

Bidirectional Dual Active Bridge Power Converter for Spacecraft Power Systems, Phase I
(<https://techport.nasa.gov/image/137156>)



Final Summary Chart Image

Bidirectional Dual Active Bridge Power Converter for Spacecraft Power Systems, Phase I Project Image
(<https://techport.nasa.gov/image/131896>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Mainstream Engineering Corporation

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

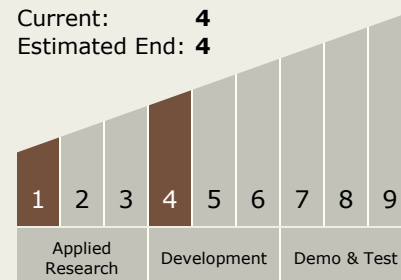
Carlos Torrez

Principal Investigator:

Troy Beechner

Technology Maturity (TRL)

Start: **1**
Current: **4**
Estimated End: **4**



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Technology Areas

Primary:

- TX03 Aerospace Power and Energy Storage
 - └ TX03.3 Power Management and Distribution
 - └ TX03.3.3 Electrical Power Conversion and Regulation

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System